REMARKS/ARGUMENTS

Reconsideration is respectfully requested.

Claims 8-13 are pending before this amendment. By the present amendment, No claims are amended for the reasons below. No new matter has been added.

In the office action (page 2), claims 8-13 stand rejected under 35 U.S.C. §112, ¶1 as failing to comply with the written description requirement. The examiner requests that the applicant cite the appropriate section of the specification which supports the previous amendment to claim 8, along with appropriate clarification.

The amendment to claim 8 in the previous response recites:

> --wherein the matrix liquid crystal, in which the liquid crystal-soluble particles are dissolved or dispersed, shows an electro-optical response such that a voltage at which the matrix liquid crystal starts its response changes depending on a frequency of applied electric field--

It is respectfully submitted that this amendment is fully supported by FIG. 3 below (a graph showing the relative light transmittance to the effective value of applied voltage which uses the frequency as parameters) and its accompanying description.

Fig. 3

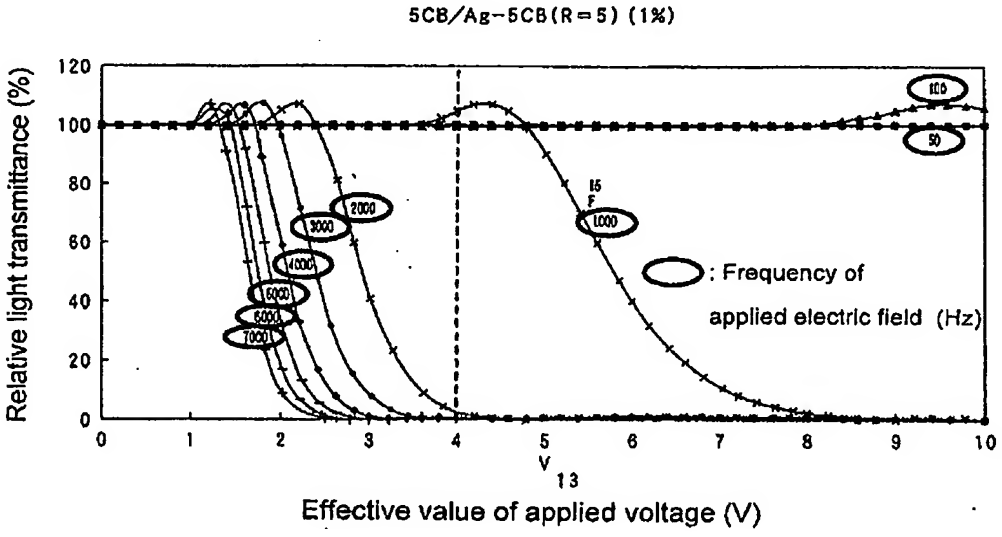

FIG. 3 is a graph showing the relative light transmittance to the effective value of

applied voltage which uses the frequency as parameters obtained in the examples (see brief description of the drawings and description of the Example on pages 20-21). In FIG. 3, the effective value of applied voltage is shown in the X axis, the relative light transmittance is shown in the Y axis, and the frequency value of applied electric filed which is the parameter is marked with a circle.

In FIG. 3, as the frequency increases from 50 Hz to 7000 Hz, the threshold voltage (a voltage at which the liquid crystal starts its response) decreases. That is, it is apparent from FIG. 3 that the threshold voltage (a voltage at which the liquid crystal starts its response) changes by changing the frequency within the scope of 50 Hz to 7000 Hz. Accordingly, it is apparent from FIG. 3 that the voltage at which the liquid crystal starts its response changes according to the frequency of the applied electric field.

As such, the applicants respectfully submit that it is apparent from FIG. 3 and its accompanying description that --the matrix liquid crystal, in which the liquid crystal-soluble particles are dissolved or dispersed, shows an electro-optical response such that a voltage at which the matrix liquid crystal starts its response changes depending on a frequency of applied electric field--. Accordingly, while the specification may not explicitly contain the exact language of the amendment, the applicants respectfully submit that a person of ordinary skill in the art would readily appreciate that the feature was contemplated in light of the clear support discussed above.

In the office action (page 3), claims 8-13 stand rejected under 35 U.S.C. §103(a) as being obvious over "Frequency modulation response of a tunable birefringent mode nematic liquid crystal electrooptic device fabricated by doping nanoparticles of Pd covered with liquid-crystal molecules" (Yoshikawa) in view of U.S. Patent No. 4,370,647 (Brantingham) and U.S. Patent No. 4,909,605 (Asano).

Specifically, the examiner states that Yoshikawa discloses the following: "each of the liquid crystal-soluble particles comprises a core having a diameter smaller than 100 nm and comprising one or a plurality of nanoparticles, and a protective layer comprising liquid crystal molecules or liquid crystal-like molecules provided on a periphery of the core", "the liquid crystal layer has liquid crystal-soluble particles dissolved or dispersed

in a matrix liquid crystal", "the liquid crystal device is driven by modulating frequency of the applied voltage", and "the voltage at which the liquid crystal starts its response changes depending on a frequency of applied electric filed".

Further, the examiner states Brantingham explains that the resultant frequency of the voltage signal applied to the ON segments, Fon is greater than the resultant frequency of the corresponding signal applied to the OFF segment, Foff and that the individual segments can be turned on and off by varying the frequency (col. 6, lines 16-33). The examiner comments that these descriptions given in Brantingham intend that "an electro-optical response can be turned on by switching the frequency of the applied electric field from low frequency to high frequency, and turned off by switching the frequency from high frequency to low frequency" (page 7, paragraph 3, Office Action).

However, the above-mentioned description given by Brantingham is not intended to and does not disclose that an electro-optical response can be turned on by switching the frequency of the applied electric field from low frequency to high frequency, and turned off by switching the frequency from high frequency to low frequency.

The reasons are given in detail below.

Brantingham explains in FIG. 2 the principle of using the equivalent electrical circuit for the liquid crystal display (col. 4, line 59 to col. 5, line 51). V_{app} is the voltage applied the display and V_{eff} is the effective voltage across liquid crystal material (col. 4, lines 63-66).

The ration V_{eff}/V_{app} is a function of ω r (formula (3) and (4), col. 5, lines 49-51). Here, $\omega=2\pi F$ and F is the resultant frequency of the applied voltage (col. 5, lines 4-5). Further, r is the resistance per unit area of display (col. 5, lines 47-48). As the value of ω r increases, the ratio V_{eff}/V_{app} is increased (FIG. 3, col. 5, lines 58-60).

In the liquid crystal display, the maximum number of drive lines N_{max} is expressed by the formula (5). In the formula (5), V_{on} is the voltage signal applied to the ON segments and V_{off} is the voltage signal applied to the OFF segments (col. 6, lines 2-5).

For example, a voltage for frequency necessary for the ON segments is first applied. In case that the threshold voltage V_{th} is 1.08V and the saturated voltage of the liquid crystal is 1.66V (col. 6, lines 34-50), and the ratio $V_{eff}/V_{app}=0.91$, the effective

value of the threshold voltage V_{ATH} is 1.2V(=1.08/0.91) (col. 6, lines 51-60). As this time, V_{off} must be less than V_{ATH} and V_{on} must be greater that V_{ASAT}. Accordingly, N_{max} is 6 (formult (5), col. 6, lines 60-63). The drive frequency at this point is 32 hz (col. 6, line 39).

Next, the driving voltage for the OFF segments is reduced to 5.3Hz while maintaining the frequency to 32Hz for the ON segments. The value of ω r is reduced when the driving voltage is reduced to 5.3Hz, and the ratio V_{eff}/V_{app} is also reduced (FIG. 3, col. 6, lines 64-68). At that point, V_{eff}/V_{app}=0.6 and the effective value of the threshold voltage V_{ATH} is 1.8V(=1.08/0.6 (col. 6, line 68 to col. 7, line 2). Accordingly, when the frequency is reduced from 32Hz to 5.3Hz, the effective value of the threshold voltage V_{ATH} is increased from 1.2V to 1.8V. As V_{off} needs to be less than V_{ATH}, when the frequency is reduced, V_{off} increases. Thus, the ratio V_{on}/V_{off} is increased and N_{max} becomes 400 (general formula (5), col. 7, lines 2-4).

Thus, in Brantingham, the ration V_{on}/V_{off} is increased and N_{max} becomes 400 (general formula (5), col. 7, lines 2-4).

Thus, in Brantingham, the ratio V_{on}/V_{off} is increased by making F_{on} (frequency of the voltage signal applied to the ON segments) larger than F_{off} (frequency of the voltage signal applied to the OFF segments), and thereby enhancing multiplexing capability (col. 6, lines 16-33).

In other words, Brantingham relates to the multiplexing driving of passive matrix driving of the liquid crystal display, i.e., the so-called Direct multiplexing technique (see abstract and background of the invention).

Therefore, contrary to the examiner's assertions, Brantingham does not teach that an electro-optical response of a liquid crystal layer can be turned on by switching the frequency of the applied electric field from low frequency to high frequency, and turned off by switching the frequency from high frequency to low frequency.

As such, the present invention is not obvious even when Brantingham is combined with Yoshikawa.

Further, Yoshikawa relates to the high speed response technique of the liquid crystal element, whereas Brantingham relates to a Direct multiplexing technique of the

liquid crystal display. Thus, although Yoshikawa and Brantingham both discuss a liquid crystal element, their respective technical fields and purpose/function are entirely different.

Thus, a skilled person would have no motivation to combine Yoshikwa (high speed response technique of the liquid crystal element) with Brantingham of a totally different technical field.

Additionally, the present invention relates to the high speed response technique of a liquid crystal element.

In contrast, as explained above, Brantingham relates to the Direct multiplexing technique of the liquid crystal display. Thus, although both refer to liquid crystal devices, the respective technical fields and the purpose/function of the elements of Brantingham are totally different from the features of the presently claimed invention which they are alleged to disclose (see MPEP §2143.02), and in fact, Brantingham does not disclose an electro-optical response can be turned on by switching the frequency of the applied electric field from low frequency to high frequency, and turned off by switching the frequency from high frequency to low frequency.

Accordingly, the applicants respectfully submit that Brantingham does not suggest the frequency modulation mode of the present invention.

For the reasons set forth above, the applicants respectfully submit that Yoshikawa, Brantingham, and Asano do not teach or suggest the present invention of claim 8, whether these references are considered individually or in combination. An indication of allowable subject matter with respect to claim 8 is respectfully requested.

Claims 9-13 depend from claim 8. The applicants respectfully submit that these claims are allowable at least by virtue of their dependency as well as the additional features recited in each of these claims.

For the reasons set forth above, the applicants respectfully submit that claims 8-13 pending in this application are in condition for allowance over the cited references. Accordingly, the applicants respectfully request reconsideration and withdrawal of the outstanding rejections and earnestly solicit an indication of allowable subject matter.

This amendment is considered to be responsive to all points raised in the office

action. Should the examiner have any remaining questions or concerns, the examiner is encouraged to contact the undersigned attorney by telephone to expeditiously resolve such concerns.

Respectfully submitted,

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